

Attorney Docket No. AHUG.015
Serial No. ~~40/671,141~~
Response to Office Action mailed 7/17/2006

B. Specification

Please amend the abstract as follows:

A rod and tubing connection for coupling two or more joints of tubing sections ~~is disclosed comprising~~ comprises a plug assembly and a socket assembly. The plug assembly has a plurality of splines and the socket assembly has a plurality of receptacles adapted to receive the plurality of splines. The plurality of splines comprises a center spline and a plurality of outer splines configured to allow intermeshing with receptacle splines in a plurality of orientations. A coupling collar is used to secure the tubing joint. The plug assembly is connected to the socket assembly in a four-step process of: positioning the assemblies in close proximity, aligning the spline and the receptacle, plugging the spline into the receptacle, and then securing the two sections together with the coupling collar. The tubing joint may also have a conduit containing a wire for transmitting power and data between the adjoined sections of tubing.

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Please amend paragraph [0016] as follows:

[0016] United States Patent ~~application 10/146,288 (the '288 application)~~
6.666.274 (the '274 patent) discloses a section of tubing with coupled end connectors and
an insert containing at least one electrical wire. The insert has an outside diameter that is
approximately equal to the inside diameter of the improved tubing. The insert also has
projections at each end such that when two inserts are placed end to end, the projections
will mate up. The insert has at least one groove cut into its side and running the length of
the insert. The groove is for the placement of a wire for transmission of power to the
well bore or for the placement of a wire for transmission of data from the well bore. The
groove is installed down the length of the insert. The groove is deep enough so that when
a wire is placed inside the groove, the wire does not project beyond the outside diameter
of the insert. The insert may contain as many grooves and wire combinations as are
necessary for the particular application. The wire has an electrical connection at each end
of the insert. When the inserts are placed end to end, the insert projections line up the
electrical connectors and correct mating of the insert projections will result in correct
mating of the electrical connectors.

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Please amend paragraph [0017] as follows:

[0017] The inserts of the ~~'288 application~~ '274 patent are the same length as the tubing and are installed inside the tubing such that the insert is flush with the first end of the tubing. The inserts are then welded to the tubing or secured to the tubing by some other method. A threaded coupler is then installed on the second end of the tubing to protect the exposed insert and electrical connector. The coupler will also be used to secure the improved tubing together. One of the methods disclosed by the ~~'288 application~~ '274 patent to solve the problem of aligning the electrical connectors for proper mating is the use of outwardly extending projections on one end and corresponding receiving recesses on the opposite end. (See Figs. 10 through 14).

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Please amend paragraph [0019] as follows:

[0019] As discussed above, a need exists for an improvement to the '744 patent to permit alignment of the tubing sections in more than one orientation. In addition, a need exists for an improvement to the '744 patent to allow the introduction of electrical wiring and connections. A further need exists for an improvement to both the '744 patent and the ~~'288 application~~ '274 patent so that the benefits of both inventions can be combined in one improved tool joint that allows connection in multiple orientations where the electrical connectors are in the tool joint itself and not in an insert. The needs identified above exist for production tubing, drill pipe, casing, and/or for any cylindrical pipe used to produce hydrocarbons in a subterranean environment.

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Please amend the [0061] paragraph as follows:

[0061] FIG. 3 is an illustration of tubing joint 100 without coupling collar 700 (see FIG. 7⁹). Tubing joint 100 comprises socket assembly 120 and plug assembly 160. Socket assembly 120 comprises coarse threads 122, receptacle 180, receptacle spline 182, and wrench grip 126. Plug assembly 160 comprises fine threads 162, spline 170, and coupling stop flange 166. Socket assembly 120 and plug assembly 160 may be like those found in U.S. Patent 5,950,744 (the '744 patent) entitled "Method and Apparatus for Aligning Pipe and Tubing," incorporated herein by reference. Typically, socket assembly 120 and plug assembly 160 are manufactured by either casting or forging. While the preferred method of attaching socket assembly 120 and plug assembly 160 to a piece of tubing is welding, those skilled in the art will be aware of other methods of attaching socket assembly 120 and plug assembly 160 to a piece of tubing. Regardless of the method of manufacture and/or attachment, the inside diameter of socket assembly 120, plug assembly 160, and the tubing are substantially the same. Spline 170 comprises center spline 172 and a plurality of outer splines 174. For simplicity of illustrating the invention, FIGS. 3 through 12A depict an embodiment having two outer splines 174. Embodiments with other spline configurations are illustrated in subsequent figures. The improved tubing shown in FIG. 3 illustrates center spline 172 extending beyond two outer splines 174.

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Please amend paragraph [0070] as follows:

[0070] FIG. 12A illustrates an embodiment of tubing joint 100 that further comprises conduit 1010 that may contain conductors. Conductors may be wires, electrically conductive material, or material capable of transmitting optical signals. Examples of conduit 1010 are illustrated in United States Patent 6,666,274 application ~~10/146,288~~ entitled "Tubing Containing Electrical Wiring Insert," incorporated herein by reference. Conduits 1010 may be formed by inserting a plastic tube with one or more grooves to conductors in a groove between the plastic tube and the tubing. Alternatively, conduits 1010 may be formed by running a conductor through the tubing and coating the conductor with a suitable coating such as plastic, glass-reinforced epoxy (GRE), or thermoplastic matrix materials such as high density polyethylene (HDPE) and polyvinyl chloride (PVC). As shown in FIG. 12A, alignment and continuity of conduits 1010 is ensured by proper orientation and mating of spline 170 with receptacle 180 and by securing tubing joint 100 with coupling collar 700. Connection 1014 represents a contact connection. A person of ordinary skill in the art will recognize that many types of connectors are available for assuring a proper electrical or optical connection between socket assembly 120 and plug assembly 160, and will be able to select the appropriate type. A more preferable way to connect the conductors will be discussed in FIG. 22 through 28.

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Please amend paragraph [0074] as follows:

[0074] FIGS. 22 through 28 illustrates a further embodiment of the present invention in which tubing joint 100 has been adapted for the passage and connection of wire 300. Alternate plug assembly 360 has conduit 372 adapted for passage of wire 300. Conduit 372 has outside aperture 370 and inside aperture 374. Connector 304 is affixed to alternate plug assembly 360 at outside aperture 370 forming a seal between connector 304 and alternate plug assembly 360. Alternate plug assembly 360 has reduced outside diameter section 378 that creates interior lip 376 allowing wire 300 to exit inside aperture 374 and pass through into the casing interior 302. Alternate socket assembly 320 has conduit 322 adapted for passage of wire 300. Conduit 322 has outside aperture 330 and inside aperture 324. Recess 306 is adapted for receiving connector 304 through alternate socket assembly aperture 332. Alternate socket assembly 320 has reduced outside diameter section 328 that creates interior lip 326 allowing wire 300 to exit inside aperture 324 and pass through into casing interior 340 and be coated with coating 302. Coating 302 may be plastic, glass-reinforced epoxy (GRE), or thermoplastic matrix materials such as high density polyethylene (HDPE) and polyvinyl chloride (PVC). Moreover, coating 302 may be any suitable material known to persons skilled in the art.

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Please amend paragraph [0075] as follows:

[0075] Wire 300 should be installed so that the length of wire 300 within the casing interior ~~302~~ is longer than the distance between alternate plug assembly inside aperture 374 and alternate socket assembly interior aperture 324. The extra wire length allows for flexing of the casing and for expansion of the casing due to heat. Wire 300 may be encased in epoxy ~~302~~ or some similar adhesive used to affix wire 300 to the casing interior ~~302~~. Alternatively, a cylindrical conduit containing wire 300 can be used and adhered to the inner wall of the casing. In other alternative embodiments, non-cylindrical conduits can be used to adhere wire 300 to the inner wall of the casing. Wire 300 contains connector 304 and connector 306 which plug together when a plurality of casing sections are secured together, as seen in FIG. 23. The present invention may include a plurality of wires 300, connectors 304, and connectors 306 within a single spline/receptacle of the plug/socket assembly depicted herein. FIGS. 24-26 illustrate different wire configurations within the present invention. A person of ordinary skill in the art will be able to create additional wire configurations other than those depicted in FIGS. 24 through 26. As seen in FIGS. 27 and 28, the present embodiment of the present invention may be aligned, plugged, and secured together with a coupling collar in the fashion as the previous embodiments of the present invention.